Projectile and Target Fragmentation in the Interaction of ^{12}C and ^{27}Al

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Most of the studies involving the interaction of light nuclei were performed at incident energies well below 10 MeV/amu where mean field processes together with particle evaporation are able to describe the data. Above 10 MeV/amu, however, nucleonic degrees of freedom become increasingly important. The need for a better understanding of the predominant reaction mechanisms regarding the interactions of light nuclei at these energies is further stimulated by the increasing number of applications e.g. in hadron therapy with carbon beams.

Previous studies of Intermediate Mass Fragments (IMFs) emitted in the interaction of ^{12}C and ^{16}O with medium to heavy mass nuclei at incident energies of some tens of MeV/amu have convincingly demonstrated that the IMFs can originate from two unrelated mechanisms: binary fragmentation of the projectile and nucleon coalescence. In the case of two light nuclei this scenario may change. If it is assumed that fragments emitted from this interaction are due in part to projectile and in part to target fragmentation, a significant dependence on the entrance channel of the c.m. fragment yield in the forward and backward direction is to be expected.

Angular distributions of the emitted IMFs ($4 \leq Z \leq 14$) were measured in ^{27}Al on ^{12}C as well as in the inverse reaction at incident energies corresponding to a c.m. excitation energy of 108 MeV. Double differential cross sections of the inclusive IMF spectra are compared to model calculations, which include the direct breakup as well as nucleon coalescence. These results indicate the relative importance of projectile and target breakup contributing to the IMF spectra at small and large scattering angles, respectively.

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